TECHNICAL MEMORANDUM NO. 74-11

SHELTER, LIGHTWEIGHT, SMALL GROUP (4-6 MAN)

by

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Final Report for Period July 70 - October 73

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The purpose of this task was to design and develop environmental kits, sunshade and liner, for the medical treatment tent developed by USALWL under Task 01-S-66. The kits were required in order that the medical treatment tent could be evaluated as a general purpose tent in extreme environmental conditions. The environmental kits developed are lightweight, easy to install and will provide additional protection when used with the tent in extreme hot or cold environments.

PREFACE

The USALWL wishes to acknowledge the efforts of the Arctic Institute of North America (AINA) which provided logistical support to USALWL personnel during field tests conducted in Canada in 1971 and to express appreciation to Mr. Joseph C. Labelle, AINA, who evaluated 4-6 Man, Shelter, on Mount Logan, Canada, in 1972 during an evaluation of other mountaineering equipment.

The US Army JFK for Military Assistance, Ft. Bragg, NC, US Army Northern Warfare Training Center, Ft. Wainwright, Alaska, and the Special Forces Detachment (Airborne) Europe conducted field evaluation on the Shelter, Light Weight, Small Group.

INTRODUCTION

In 1966 the USALWL initiated a task to design and develop a medical tent which could be used by special forces troops to perform emergency treatment in remote areas. The final design evolved from a commercial model and a quantity of tents were fabricated and offered for field evaluation. The doctrine change to immediate medical evacuation of wounded personnel from the field by helicopter, which occurred during the development of the tent, negated the requirement and plans for a field evaluation were cancelled. Results of this task have been published in Tech Report No. 69-20 dtd Nov 1969.

Other organizations became interested in the tent as a lightweight shelter and as a result, a DPSDR was prepared in July 1969 around the medical treatment tent. This document specified the development of environmental kits to permit use of the tent in all environments and resulted in the initiation of USALWL's Task 02-S-71, Shelter, Lightweight, Small Group (4-6 Man). A sunshade and a liner were developed for the shelter and field tests were conducted in extreme environments. The kits are lightweight, easily installed and provide additional protection to personnel required to operate in extreme conditions. Prototype tents have been fabricated and are presently being evaluated by units in the field.

DESIGN AND DEVELOPMENT OF ENVIRONMENTAL ACCESSORY KITS

Thermal Liner

A thermal liner of 1/8 inch Ensolite (closed-cell, foamed vinyl material) was fabricated. The seams in the liner were cemented with an adhesive and taped. The tape/adhesive proved troublesome because of difficulties in shaping to the curved seams so the tapes were removed. All joints were cemented with an adhesive and each seam was sewn with a long stitch to hold the pieces while the adhesive dried. The liner had ties connected to patches which were cemented to the liner. These ties corresponded to loops on the main structure. (See Figure 1.) The ties/loops are color coded to simplify installation. Ensolite has a thermal conductivity approximately twice that of dry air so that it provides fairly good insulation by itself, but great improvements can be achieved by leaving an air space between the tent and the liner. For this reason the loops on the tent were sewn so that the liner would hang about 2 inches from the tent material.

The Ensolite, although an excellent insulator, was bulky and entirely unsuitable as a tent liner since it did not breathe. Moisture condensed on the inner surface forming ice crystals which fell on the occupants. A nylon ripstop camouflage material weighing 1.9 ounce per square yard was then fabricated into a liner and tested. Although this liner was not as effective an insulator as the Ensolite, it did provide adequate insulation and protection from drafts. In addition, it allowed moisture to pass through the porous material of the liner to the inner surface of the tent where it condensed. The nylon fabric liner was lighter in weight, folded into a small package and did not absorb moisture. A stovepipe outlet was provided both in the liner and tent so that the pot belly stove M1940 or Yukon Stove M1941 could be used to heat the tent. When using either stove, adequate ventilation is required.

Sunshade

A sunshade was developed from basic tent material which weighs 3.95 ounces per square yard. The design was based on the double roof principle to allow air flow between the two roofs. This sunshade fits over the fiberglass rods (Figure 2) and is staked to the ground. The center of the sunshade is approximately one foot from the tent material, permitting air to flow between the fabrics resulting in cooler interior temperatures in the tent. It was noted that the sunshade/thermal liner combination not only reduced the tent temperature during use in hot and moderate temperatures but also provided warmth in cold temperatures.

Figure 1

Figure 2

TESTING

Testing of the environmental kits has been conducted on prototype tents at Aberdeen Proving Ground, MD; St. Elias Mountain Range; Yukon Territory, Canada; Yuma Proving Ground, AZ.

Initially, the tents were allowed to stand for several days at Aberdeen Proving Ground, to test the effects of moderate environmental stresses. The tents withstood 15 mph winds and heavy rains without any problems. The tents were then tested in the St. Elias Mountain Range where harsh environmental conditions were experienced during the five day test period. Ten inches of snow within an eight-hour period, winds up to 40 mph, and temperatures as low as -10°F were experienced during this test. Test personnel utilized the tents for living and sleeping quarters, which simulated conditions a soldier would experience in the same environment. The structure proved to be rugged, serviceable, comfortable and aerodynamically sound.

Limited testing of the tent in a hot dry environment was conducted at Yuma Proving Ground, using the thermal liner, the sunshade and liner/sunshade combination. Mid-tent and inside fabric temperatures were recorded along with the appropriate meteorological data. Temperatures were also recorded on a tent without a liner or sunshade. The ambient temperatures ran as high as 100°F during the test period.

Results of these tests were not statistically significant since the sample size was too small.

Following the environmental field testing by USALWL, a quantity of tents were fabricated and shipped to the field for evaluation. Evaluation is presently being conducted by US Army John F. Kennedy Center for Military Assistance, Ft. Bragg, NC; US Army Northern Warfare Training Center, AK; and the Special Forces Detachment (Airborne) Europe. Results of these evaluations should be available in September 1974.

CONCLUSIONS

1. A frost liner must be used in cold environments to prevent ice crystals which form on the coated tent fabric from falling on occupants. The liner also provides additional insulation against the cold.

2. A sunshade or sunshade/liner combination provides added protection from high temperatures.

3. The external frame concept is functionally superior to the present Army Tent Lightweight M1950.

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